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Report of the individual review of the inventory submission of Turkey submitted in 2013*

* In the symbol for this document, 2013 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Introduction and summary

1. This report covers the review of the 2013 inventory submission of Turkey, coordinated by the UNFCCC secretariat, in accordance with decision 19/CP.8. The review took place from 16 to 21 September 2013 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Harry Vreuls (Netherlands) and Ms. Melissa Weitz (United States of America); energy – Mr. Graham Anderson (Australia), Mr. Constantin Harjeu (Romania), Ms. Anna Sikharulidze (Georgia) and Mr. Sergiy Skybyk (Ukraine); industrial processes and solvent and other product use – Ms. Ingrid Person Rocha e Pinho (Brazil) and Mr. Samir Tantawi (Egypt); agriculture – Mr. Michael Anderl (Austria), Ms. Rocio Danica Condor (Italy) and Mr. Paulo Cornejo (Chile); land use, land-use change and forestry (LULUCF) – Mr. Manuel Estrada (Mexico), Ms. Akane Nagahisa (Japan) and Mr. Nalin Srivastava (India); and waste – Ms. Baasansuren Jamsranjav (Mongolia) and Mr. Gustavo Barbosa Mozzer (Brazil). Ms. Person and Mr. Vreuls were the lead reviewers. The review was coordinated by Ms. Kyoko Miwa (UNFCCC secretariat).

2. In accordance with the "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" (hereinafter referred to as the UNFCCC review guidelines), a draft version of this report was communicated to the Government of Turkey, which provided comments that were considered and incorporated, as appropriate, into this final version of the report. All encouragements and recommendations in this report are for the next inventory submission, unless otherwise specified. The expert review team (ERT) notes that the 2012 annual review report of Turkey was published on 3 April 2013.

3. In 2011, the main greenhouse gas (GHG) in Turkey was carbon dioxide (CO_2), accounting for 81.6 per cent of total GHG emissions[1] expressed in CO_2 equivalent (CO_2 eq), followed by methane (CH_4) (13.9 per cent) and nitrous oxide (N_2O) (3.0 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.5 per cent of the overall GHG emissions in the country. The energy sector accounted for 71.3 per cent of total GHG emissions, followed by the industrial processes sector (13.3 per cent), the waste sector (8.6 per cent) and the agriculture sector (6.8 per cent). Total GHG emissions amounted to 422,415.82 Gg CO_2 eq and increased by 124.2 per cent between 1990 and 2011. The ERT concludes that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

4. Tables 1 and 2 show GHG emissions under the Convention, by gas and by sector, respectively. In table 1, CO_2, CH_4 and N_2O emissions do not include emissions and removals from the LULUCF sector.

5. Additional background data on recalculations by Turkey in the 2013 inventory submission can be found in annex I to this report.

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

Table 1
Greenhouse gas emissions by gas, 1990 to 2011

	Gg CO_2 eq								
Greenhouse gas	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*2011*	*Change 1990–2011 (%)*
CO_2	141 560.05	174 087.09	225 608.57	259 765.89	297 282.81	299 267.27	326 551.62	344 693.82	143.5
CH_4	34 053.56	47 393.30	53 807.46	52 817.51	54 358.07	54 105.73	57 586.86	58 811.44	72.7
N_2O	12 217.20	16 823.47	17 142.31	14 673.53	12 053.86	12 996.33	13 079.18	12 652.05	3.6
HFCs	NA, NE	NA, NE	818.43	2 379.00	2 669.43	2 839.25	4 009.30	5 308.29	NA
PFCs	603.43	516.43	515.12	487.76	C, NA, NE	C, NA, NE	C, NA, NE	C, NA, NE	NA
SF_6	NA, NE	NA, NE	322.89	858.73	843.10	803.47	875.78	950.23	NA

Abbreviations: C = confidential, NA = not applicable, NE = not estimated.

Table 2
Greenhouse gas emissions by sector, 1990 to 2011

	Gg CO_2 eq								
Sector	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*2011*	*Change 1990–2011 (%)*
Energy	132 882.67	161 501.98	213 199.87	242 344.47	278 333.29	278 947.98	285 065.55	301 250.34	126.7
Industrial processes	15 442.26	24 206.65	24 373.81	28 780.76	29 829.90	31 686.98	53 944.10	56 205.77	264.0
Solvent and other product use	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA
Agriculture	30 387.74	29 234.20	27 847.56	26 280.12	25 472.99	26 104.14	27 126.84	28 833.07	–5.1
LULUCF	–15 380.94	–20 073.51	–45 499.99	–45 008.20	–39 415.52	–38 958.57	–40 603.23	–43 640.26	183.7
Waste	9 721.57	23 877.45	32 793.53	33 577.07	33 571.10	33 272.96	35 966.25	36 126.64	271.6
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	**173 053.29**	**218 746.77**	**252 714.80**	**285 974.22**	**327 791.75**	**331 053.48**	**361 499.51**	**378 775.57**	**118.9**
Total (without LULUCF)	**188 434.23**	**238 820.28**	**298 214.78**	**330 982.42**	**367 207.27**	**370 012.05**	**402 102.75**	**422 415.82**	**124.2**

Abbreviations: LULUCF = land use, land-use change and forestry, NA = not applicable, NE = not estimated.

II. Technical assessment of the inventory submission

A. Overview

1. Inventory submission and other sources of information

6. The 2013 annual inventory submission was submitted on 15 April 2013; it contains a complete set of common reporting format (CRF) tables for the period 1990–2011 and an NIR. The CRF tables were submitted on 12 April 2013. The inventory submission was submitted in accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines).

7. The full list of materials used during the review is provided in annex II to this report.

2. Overall assessment of the inventory

8. Table 3 contains the ERT's overall assessment of the inventory submission of Turkey. For recommendations for improvements related to cross-cutting issues for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the inventory submission

		General findings and recommendations
The expert review team's (ERT's) findings on completeness of the 2013 inventory submission		In the industrial processes sector, several categories have been reported as confidential ("C"), but emissions from those categories have not been included in the national totals (see paras. 35, 45, 47, 48, 49 and 52 below). The ERT strongly recommends that Turkey include emission estimates for those categories
Non-land use, land-use change and forestry[a]	Not complete	Mandatory: "NE" is reported for: CO_2 and CH_4 emissions from distribution of oil products, CO_2 and CH_4 emissions from natural gas distribution, CO_2 and CH_4 emissions from venting – combined and CO_2, CH_4 and N_2O emissions from flaring – combined in the energy sector; SF_6 emissions from SF_6 used in aluminium foundries, PFC and SF_6 emissions from refrigeration and air conditioning, SF_6 emissions from fire extinguishers, SF_6 emissions from electrical equipment and HFC, PFC and SF_6 emissions from aerosols, solvents, other applications using ozone-depleting substance substitutes and semiconductors under consumption of halocarbons and SF_6 in the industrial processes sector; N_2O emissions from anaesthesia in the solvent and other product use sector; and CH_4 emissions from industrial wastewater and CO_2, CH_4 and N_2O emissions from waste incineration for the period 1990–1994 in the waste sector
		Non-mandatory: "NE" is reported for CH_4 emissions from solid fuel transformation, CO_2 emissions from paint application, CO_2 and N_2O emissions from degreasing and dry cleaning, CO_2 emissions from chemical products and

		General findings and recommendations
		N_2O emissions from other (solvent and other product use) in the solvent and other product use sector; and N_2O emissions from industrial wastewater in the waste sector
Land use, land-use change and forestry[a]	Not complete	Mandatory: "NE" is reported for: the carbon stock changes in a number of pools under the mandatory categories, including the carbon stock changes in mineral soils under forest land remaining forest land and land converted to forest land; the carbon losses in living biomass and the carbon stock changes in dead organic matter and organic soils under grassland converted to cropland; the carbon stock changes in all pools under wetlands, settlements and other land converted to cropland; the carbon gains in living biomass and in mineral soils under grassland remaining grassland; the carbon gains in living biomass and the carbon stock changes in dead organic matter and organic soils under cropland converted to grassland; the carbon stock changes in all pools under wetlands converted to grassland; the carbon gains in living biomass under other land converted to grassland; the carbon stock changes in all pools under forest land converted to wetlands; the carbon gains in living biomass and the carbon stock changes in dead organic matter and soils under cropland and grassland converted to wetlands; the carbon stock changes in all pools under forest land, cropland, and grassland converted to settlements; N_2O emissions from disturbance associated with land-use conversion to cropland under land converted to cropland except for forest land converted to cropland; CO_2 emissions from limestone application to cropland; and CO_2, CH_4 and N_2O emissions from wildfires under forest land remaining forest land
		Non-mandatory: "NE" is reported for: the carbon stock changes in dead organic matter and soils under forest land, cropland and grassland converted to wetlands; the carbon stock changes in dead organic matter under forest land, cropland and grassland converted to settlements; the carbon stock changes in dead organic matter under cropland remaining cropland; and the carbon stock changes in all pools under wetlands remaining wetlands and settlements remaining settlements
The ERT's findings on recalculations and time-series consistency in the 2013 inventory submission	Generally consistent	The ERT noted some inconsistencies between CRF tables 8(a) and 8(b), as well as between the information in the CRF tables and in the NIR (see para. 18 below) The ERT also noted a number of time-series consistency issues with regard to the data sources used. Category-specific recommendations regarding recalculations can be found in paragraphs 24 and 41 below
The ERT's findings on verification and quality	Not sufficient	Limited information was provided on the general QA/QC procedures implemented by Turkey. The NIR states that the

		General findings and recommendations
assurance/quality control procedures in the 2013 inventory submission		Party is preparing a QA/QC plan and that the new QA/QC plan will be used for the next submission. Turkey is also planning to implement sector-specific QA/QC procedures The improvement of QA/QC at all stages of the inventory preparation process and the enhancement of the documentation on the QA/QC procedures is required. The recommendation on setting sector-specific QA/QC goals needs to be addressed by Turkey in order to improve the quality of the reporting of data at the sectoral level (see paras. 15, 36, 61, 75 and 93 below) Many recommendations made in previous review reports have not been taken into consideration for a number of years
The ERT's findings on the transparency of the 2013 inventory submission	Not sufficient	The ERT recommends that Turkey make additional efforts to improve the documentation provided in the inventory in order to increase transparency, by providing descriptions at a more disaggregated level and by including specific information on the rationale for the choice of the methods, descriptions of the methods, EFs, assumptions and AD used, descriptions of time series emission fluctuations, and improvement plans by category (see paras. 15, 19, 26, 29, 33, 36, 38, 39, 42, 44, 50, 51, 52, 56, 57, 61, 63, 72, 74, 77, 78, 79, 80, 83, 84, 85, 86, 87, 88, 91 and 97 below) Further, the ERT recommends that Turkey provide, in the NIR, references to the external sources used for the preparation of the inventory, and information on the uncertainties, QA/QC procedures and planned improvements (see para. 15 below)

Abbreviations: AD = activity data, C = confidential, CRF = common reporting format, EFs = emission factors, ERT = expert review team, NE = not estimated, NIR = national inventory report, QA/QC = quality assurance/quality control.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

9. The ERT notes that a number of categories have been reported as not estimated ("NE"), particularly in the energy, industrial processes and waste sectors (see table 3 above). In addition, in the industrial processes sector, emissions from categories reported as confidential ("C") have not been included in the national totals (see para. 35 below). The ERT recommends that Turkey include emission estimates for those categories.

3. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

10. The NIR described the institutional arrangements for the preparation of the inventory. The Turkish Statistical Institute (TurkStat) has overall responsibility for the national inventory. Other organizations are also involved in the preparation of the inventory.

Emissions from the energy sector are calculated by TurkStat using data from the Ministry of Energy and Natural Resources (MENR). Emissions from electricity generation are calculated by MENR, and the emissions from transportation are calculated by the Ministry of Transport, Maritime Affairs and Communications. Emissions and removals from the LULUCF sector are provided by the Ministry of Food, Agriculture and Livestock and the Ministry of Forest and Water Affairs. Emissions of HFCs, PFCs and SF_6 are estimated by the Ministry of Environment and Urbanization. TurkStat compiles and submits the inventory. The overall organization of the inventory system allows for the timely reporting of GHG emissions. However, Turkey has not ensured that the organization is able to respond to questions and requests made by the ERT during the review week in a timely manner (see para. 13 below).

Inventory preparation

11. Table 4 contains the ERT's assessment of Turkey's inventory preparation process. For improvements related to specific categories, please see the paragraphs cross-referenced in the table.

Table 4
Assessment of inventory preparation by Turkey

		General findings and recommendations
Key category analysis		
Was the key category analysis performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF)?	Yes	A key category analysis, both level and trend assessment, was performed, including and excluding LULUCF. The results of the analysis were entered incorrectly into CRF table 7: column F ("key category excluding LULUCF") should include the notation "x" for all categories that are considered key according to the analysis without LULUCF. Turkey has instead marked only those categories that are key without LULUCF but are not key according to the analysis with LULUCF
Approach followed?	Tier 1	
Were additional key categories identified using a qualitative approach?	No	
Does Turkey use the key category analysis to prioritize inventory improvements?	Yes	
Are there any changes to the key category analysis in the latest submission?	No	
Assessment of uncertainty analysis		
Approach followed?	Tier 1	
Was the uncertainty analysis carried out consistent with the IPCC good practice guidance and the IPCC good practice	No	The ERT recommends that Turkey improve the documentation by providing more information on the assumptions used in the uncertainty analysis for all categories, and information on how the

		General findings and recommendations
guidance for LULUCF?		results of the uncertainty analysis are used in the inventory improvement plan (see para. 33 below) The LULUCF categories need to be further disaggregated, consistent with the IPCC good practice guidance for LULUCF The total uncertainty decreased from 10.3 per cent in the 2012 inventory submission to 5.2 per cent in the 2013 inventory submission; however, the main cause of this decrease (mostly due to recalculations in the LULUCF sector) has not been documented in the NIR The ERT encourages Turkey to provide a quantitative uncertainty analysis, excluding LULUCF, in the next inventory submission
Quantitative uncertainty (including LULUCF)	Level = 5.2%	
	Trend = not provided	
Quantitative uncertainty (excluding LULUCF)	Level = not provided	
	Trend = not provided	

Abbreviations: CRF = common reporting format, ERT = expert review team, LULUCF = land use, land-use change and forestry, NIR = national inventory report.

Inventory management

12. Turkey does not yet have a centralized archiving system, but plans are being developed. The Party stated in the NIR that TurkStat has been working on the establishment of the Emission Inventory Portal, which will comprise three components: a database, a web-based data collection, and a documentation and archiving system. Turkey further explained in the NIR that the first component of the Emission Inventory Portal is 95 per cent completed and that the other two components are not yet completed. As the Party prepares to finalize the Emission Inventory Portal, the ERT reiterates the encouragement in previous review reports that Turkey complete the development of the third component, the documentation and archiving system, so that the portal includes disaggregated emission factors (EFs) and activity data (AD) and documentation on such EFs and AD. The ERT further encourages Turkey to include, in developing the Emission Inventory Portal: internal documentation on quality assurance/quality control (QA/QC) procedures; internal and external reviews; and documentation on key category analyses, uncertainty analyses and planned inventory improvements.

13. The overall organization of the inventory system allows for the timely reporting of GHG emissions. However, Turkey has not ensured that the organization is able to respond to requests made by the ERT during the review process in a timely manner. The ERT sent a number of questions to Turkey before and during the review week; however, in many cases, responses were delayed. In some cases, responses were not received until the end of the review week. For all questions on the LULUCF sector sent to Turkey during the review week, the Party sent its responses to the ERT three days after (24 September 2013) the end of the review week (21 September 2013). This significant delay in responding to the ERT's questions created significant difficulties for the ERT in performing the review in a complete and timely manner, not only for the review of Turkey's inventory, but also for all reporting

Parties whose submissions were being reviewed by the same ERT in the same week. The ERT encourages Turkey to review its inventory system and processes to ensure that questions and requests from future ERTs are handled in a timely manner, in order to enable the ERT to conduct the review during the review week.

4. Follow-up to previous reviews

14. The ERT noted that most of the recommendations made in the previous review report have not been addressed in the 2013 inventory submission, owing to the late finalization of the annual review report, published on 3 April 2013. However, the ERT also noted that many issues that had been identified in previous review reports have not yet been addressed in the 2013 inventory submission. Further, Turkey has not provided in the NIR information on the implemented improvements, as well as planned improvement measures, initiated due to the recommendations made in previous review reports. The ERT reiterates the recommendations made in previous review reports and strongly recommends that Turkey make concerted efforts to address those recommendations and provide information on the progress made, including the planned improvement measures.

15. The recommendations made in previous review reports that have not yet been addressed by Turkey are described in the following sectoral chapters. The recommendations regarding general and cross-cutting issues made in previous review reports include:

(a) The use of higher-tier methods to estimate emissions from all key categories, in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) (see paras. 27, 37, 42, 64, 67, 69, 91 and 94 below);

(b) The completion of the ongoing work to establish the Emission Inventory Portal, as a centralized archiving system, or the provision of an update on the status of its development (see para. 12 above);

(c) The improvement of the documentation on the uncertainty analysis for all sectors when expert judgement is used; taking into account the results of the uncertainty analysis in the inventory improvement plan; and updating the uncertainty estimates for categories that have been recalculated (see para. 14 above and paras. 32 and 61 below);

(d) The improvement of the explanations of the recalculations undertaken (see para. 18 below);

(e) The finalization of the draft QA/QC plan and its inclusion in the next inventory submission; and the setting of sector-specific QA/QC goals to improve the quality of the reported data at the sectoral level (see paras. 36, 62 and 75 below);

(f) The enhancement of the QA/QC procedures for the sectoral chapters, including the technical review, to ensure consistency between the NIR and the CRF tables (see paras. 25, 27, 46 and 76 below);

(g) The improvement of the transparency of the national inventory submission by including detailed methodological information and further explanations of the EFs, AD and emission trends for all sectors and key categories, especially in the case of significant fluctuations observed; and explanations of the national circumstances and all references for the external sources used in the inventory preparation process (see paras. 40, 63, 67, 73 and 79 below).

5. Areas for further improvement identified by the expert review team

16. During the review, the ERT identified a number of areas for improvement, including some related to specific categories. These are listed in the relevant chapters of this report and in table 7 below.

B. Energy

1. Sector overview

17. The energy sector is the main sector in the GHG inventory of Turkey. In 2011, emissions from the energy sector amounted to 301,250.34 Gg CO_2 eq, or 71.3 per cent of total GHG emissions. The emissions from the energy sector have shown an increasing trend over time, although slight decreases occurred during the periods 1993–1994, 1997–1999, 2000–2001 and 2007–2008. Since 1990, emissions have increased by 126.7 per cent. The key drivers for the rise in emissions are the increases in energy consumption in energy industries, manufacturing industries and construction, transport and other sectors. Within the energy sector, 40.5 per cent of the emissions were from energy industries, followed by 23.6 per cent from other sectors, 19.1 per cent from manufacturing industries and construction and 15.9 per cent from transport. The remaining 0.8 per cent were from fugitive emissions.

18. Turkey has performed recalculations between its 2012 and 2013 inventory submissions for CH_4 and N_2O emissions from the category other (fuel combustion activities) under the energy sector (see table 8 below). The ERT notes that the reason for these recalculations was not properly documented in CRF table 8(b) (explanatory information on recalculations) as well as in the NIR. The ERT reiterates the recommendation made in the previous review report that Turkey include, in the NIR, a clear explanation in a separate section at the subcategory level for the recalculations.

19. The ERT notes that most of the AD are not properly documented in the NIR, with the exception of some background information on road transportation. Turkey explained in the NIR that information on the energy balance tables is presented in annex 8; however, that annex has not been included in the NIR. In response to a question raised by the ERT during the review, the Party informed the ERT that annex 8 was erroneously not provided. However, no further information on the AD for fuel use, and on the energy balance tables, was provided to the ERT during the review in response to questions raised by the ERT. The ERT strongly recommends that Turkey provide, in the NIR, more information on the AD used for the inventory to improve the transparency of its reporting of the inventory for the energy sector.

20. During the review, the ERT requested that Turkey report on any progress achieved in addressing the recommendations made in previous review reports. In its response to the ERT, Turkey expressed the view that, for many issues, such as the reallocation of emissions from military use under other (fuel combustion) and ensuring the time-series consistency of the emission estimates for manufacturing industries and construction, its reporting is already in line with the IPCC good practice guidance, therefore the implementation of those recommendations is not necessary. However, the ERT considers that Turkey's reporting is not in line with the IPCC good practice guidance and is further of the view that the Party's lack of efforts to address the individual problems identified by the ERT over the years has led to a situation where the transparency, accuracy, consistency and comparability of the energy sector inventory have not been achieved and, therefore, the Party's reporting cannot be considered as being in line with the IPCC good practice guidance. The ERT strongly recommends that Turkey strengthen its efforts to address the recommendations made in the

review reports and include information on how the issues have been resolved or will be resolved in the NIR of its next inventory submission.

2. Reference and sectoral approaches

21. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraphs 22–26 below.

Table 5
Review of reference and sectoral approaches

		Paragraph cross-references
Difference between the reference approach and the sectoral approach	Energy consumption: 532.01 PJ, 13.8%[a] CO_2 emissions: 23,883.62 Gg CO_2 eq, 8.11%	
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	No	22, 23
Are differences with international statistics adequately explained?	No	22, 23
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	No	24, 25
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	No	26

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] This value was taken from the apparent energy consumption comparison (including non-energy use and feedstocks) since the values excluding feedstocks for the reference approach are reported as not applicable ("NA") in the CRF tables.

Comparison of the reference approach with the sectoral approach and international statistics

22. In 2011, total CO_2 emissions estimated using the reference approach were reported as 8.1 per cent higher than those estimated using the sectoral approach. At the primary fuel level, the comparison, as presented in CRF table 1.A(c) for the comparison of CO_2 emissions from fuel combustion, resulted in larger differences, especially for liquid fuels (25.3 per cent for 2011). In addition, the ERT notes that the apparent energy consumption (excluding non-energy use and feedstocks) is reported as "NA" (not applicable) in the CRF tables for the reference approach. This leads to additional difficulties regarding the comparison of the estimates derived by the two approaches. Turkey explained in the NIR that the average calorific values and carbon content of crude oil, lignite and hard coal are used in the reference approach, while the individual calorific values and carbon content for each type of consumed fuel are used in the sectoral approach, which explains the reason for the difference between the estimates using the two approaches. In response to a question

raised by the ERT during the review, Turkey indicated that an error was identified after the submission of the 2013 inventory, leading to a reduction in the difference to 7 per cent for 2011. However, the ERT considers that the difference between the two approaches is still high. Noting that this issue of inconsistency between the two approaches has been repeatedly raised in previous review reports, the ERT is of the view that if the only reason for such discrepancy is the average calorific values and carbon content, then the approach used to obtain the average values (net calorific value (NCV) and carbon content) could be revised.

23. For 2011, the apparent consumption according to Turkey's reference approach corresponds closely to the International Energy Agency (IEA) data (a difference of 2.9 per cent). Since the reference approach corresponds closely to the IEA data and the energy consumption according to the sectoral approach (3,855.38 PJ) is much lower than the apparent consumption of the reference approach (4,387.39 PJ) (by 13.8 per cent), the fuel combustion emissions may not be fully covered in the estimates calculated using the sectoral approach. In response to questions raised during previous stages of the review, Turkey explained that the data used for the inventory submission reflect the revisions made after the submission to the IEA, and are therefore far more accurate compared to the IEA data. In addition, the Party noted that the IEA prepares the energy balance tables by combining five annual questionnaires on the country on its balance builder programme and because of the methodological difference the indicators may vary compared with Turkey's national data, and this may lead to additional inconsistencies. The ERT recommends that the Party conduct additional analysis to understand the reasons for the differences between the fuel consumption data reported to the IEA and to the secretariat and provide additional information in the NIR, taking into account the various points highlighted by the ERT, including: whether appropriate NCV values (NCVs versus gross calorific values) were used throughout the reporting (since the production and trade data for natural gas differ by approximately 10 per cent for each year of the time series in the reporting to the secretariat and to the IEA); whether feedstock and non-energy fuel use emissions were excluded from the reference approach estimates; whether a consistent approach was used to separate domestic and international bunker fuel consumption for aviation and navigation and whether comparable data were reported to the secretariat and to the IEA; and whether bunker fuel use was reported under the reference approach in CRF table 1.A(b) (see para. 25 below).

International bunker fuels

24. Turkey reported emissions from international bunkers for 2008 onwards. For 2011, the Party reported a significant rise in fuel consumption and associated emissions compared with 2010. The consumption of jet kerosene for aviation bunkers increased from 6,055.00 TJ for 2010 to 103,765.33 TJ for 2011, and emissions increased from 434.68 Gg CO_2 eq for 2010 to 7,484.65 Gg CO_2 eq for 2011. Likewise, the consumption of gas/diesel oil for marine bunkers increased from 10,098.00 TJ for 2010 to 20,097.65 TJ for 2011, and emissions increased from 750.89 Gg CO_2 eq for 2010 to 1,494.42 Gg CO_2 eq for 2011. Turkey reported that the consumption of residual fuel oil increased from 59.00 TJ for 2010 to 59,698.43 TJ for 2011, and emissions increased from 4.56 Gg CO_2 eq for 2010 to 4,636.04 Gg CO_2 eq for 2011. However, the reason for the inter-annual changes has not been explained in the NIR. In response to a question raised by the ERT during the review, Turkey explained that the data on bunker fuel consumption for 2011 were obtained from the Energy Market Regulatory Authority, while the data for the previous years of the time series were obtained from MENR, thereby leading to the inconsistency between the values for 2011 and the previous years of the time series. In response to a further question raised by the ERT during the review, the Party informed the ERT about its plans to resolve the inconsistency between the data sources and reflect the revised data in the NIR with

recalculations. The ERT recommends that Turkey determine a reliable data source to obtain accurate fuel consumption data, ensure time-series consistency in line with the IPCC good practice guidance, and estimate and report emissions from this category. The ERT also reiterates the recommendation made in the previous review report that Turkey report emission estimates for international bunker fuels for the entire time series.

25. Emissions from international bunkers for consumption of gas/diesel oil, jet kerosene and residual oil have been reported in the NIR and in CRF table 1.C, but have not been included in CRF table 1.A(b) for the reference approach. The ERT reiterates the recommendations made in previous review reports that Turkey report international bunker fuel use in CRF table 1.A(b) and CRF table 1.C in a consistent manner.

Feedstocks and non-energy use of fuels

26. The ERT noted that, in its 2013 inventory submission, Turkey has reported non-energy use of gas/diesel oil in CRF table 1.A(d) for feedstocks and non-energy use of fuels; however, the uses of all other fuels have been reported as "NA". Noting the recommendations made in previous review reports that Turkey explore the possibility of collecting more disaggregated data on the amount of feedstocks and non-energy use of fuels, the ERT requested that Turkey provide information on any steps made to address those recommendations. In response to the questions raised by the ERT during the review, the Party explained that the fuels used as feedstock and for non-energy use are not separated in its energy balance table. However, information on Turkey's efforts to address this issue was not provided to the ERT. The ERT reiterates the recommendation made in the previous review report that Turkey identify opportunities to collect additional AD on feedstocks and non-energy use of fuels. If such disaggregation continues to be impractical, the ERT recommends that Turkey revise its use of the notation key "NA" (e.g. use the notation key included elsewhere ("IE") in CRF table 1.A(d) for fuel types that are known to be used as feedstock, but for which it is not possible to disaggregate the respective AD), and provide the relevant information in the additional information boxes in CRF table 1.A(d), in order to improve the transparency of its reporting. The ERT also recommends that Turkey clearly explain in the NIR the allocation of fuels used as feedstocks and for non-energy purposes between the energy and the industrial processes sectors, as appropriate.

3. Key categories

Stationary combustion: solid, liquid and gaseous fuels – CO_2, CH_4 and N_2O[2]

27. Turkey stated in the NIR that emissions from the energy sector were estimated using an IPCC tier 1 method, except for public electricity and heat production (energy industries), and road transportation and civil aviation under transport, for which tier 2 methods were applied. In response to a question raised by the ERT during the review, Turkey explained that the main reason for the use of a tier 1 method is the lack of country-specific data. However, this is not in accordance with the IPCC good practice guidance for the key categories. The ERT reiterates the recommendations made in previous review reports that Turkey enhance its efforts to collect the necessary data and apply tier 2 methods for all key categories. The ERT also noted that the Party has reported, in CRF table summary 3, that a tier 1 method was used to estimate the CO_2 emissions from energy industries, while tier 1 and tier 2 methods were used to estimate the CH_4 and N_2O emissions from the same category, which is not consistent with the explanation provided in the NIR. The ERT

[2] Not all emissions related to all gases under this category are key categories, particularly CH_4 and N_2O emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

recommends that Turkey enhance its efforts to ensure the consistency between the information in the CRF tables and the NIR.

28. Where the tier 2 methods are applied, the country-specific values used for the emission estimates are not clearly explained in the NIR. As already pointed out in the previous review report, the data sources are often cited as being from the energy balance and sometimes from individual plants. The EFs are not sufficiently clearly elaborated to enable a comparison with the IPCC default EFs. Further, it is not clear from the NIR whether the oxidation factors and carbon content values used by the Party are all based on the country-specific data or whether some of these values are IPCC defaults. The ERT reiterates the recommendation made in previous review reports that Turkey include further information on the data sources and methodologies used for the calculation of the EFs at the plant level, and compare the country-specific EFs with the IPCC default EFs.

29. The ERT notes that Turkey reported in the NIR the possibility of using waste as fuel in the cement plants. As explained by the Party in the NIR, the waste co-incinerated through licence agreements includes waste plastics, used tyres, waste oils, industrial sludge, tank bottom sludge and biomass. Turkey also stated that the incineration of such waste for energy is considered under the energy sector of the inventory. The ERT further notes that the recommendations in the previous review report included that the Party transparently document where the emissions from the incineration of waste fuels in cement kilns are reported, since Turkey reported in the NIR that waste is incinerated in cement kilns, but no such emissions were reported in the CRF tables. However, the Party has not included such information in the 2013 inventory submission. In response to a question raised by the ERT during the review, Turkey explained that it derives the energy data for its emission estimates from the energy balance tables, and that it is not possible to separate the waste used as fuel in those tables. For that reason, it is not possible to report emissions from the incineration of waste. Turkey further explained that, after separation, those emissions should be reported under the energy sector; however, there is no mention in the Party's response of any plan to explore the possibility of separating the data on the waste used for fuel. The ERT strongly reiterates the recommendation made in the previous review report that Turkey transparently document where the emissions from the incineration of waste fuels in cement kilns are reported and, if they are not reported, use the appropriate notation key (e.g. "NE").

Road transportation: liquid fuels – CO_2, CH_4 and N_2O[3]

30. Turkey stated in the NIR that a model based on the COPERT model with certain modifications according to country specifications was used to estimate emissions from road transportation. However, the ERT noted that the Party has not provided information on the model version or on the modifications made to the model, as recommended in previous review reports. Further, the ERT noted that Turkey has not addressed the recommendations made in previous review reports that the Party improve the documentation on the methods applied and provide information on all the EFs, assumptions and AD used in developing the country-specific model. Turkey explained in the NIR that the energy-based emission calculations are initially conducted according to an IPCC tier 1 approach in order to obtain the CO_2 emissions as a basis for the comparison of the model results, following which an IPCC tier 2 approach is conducted using the vehicle fleet and traffic AD to calculate the CO_2 emissions. However, it is not clear which of these two estimation results have been included in the CRF tables. In response to a question raised by the ERT during the review,

[3] Not all emissions related to all gases under this category are key categories, particularly CH_4 and N_2O emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

Turkey explained that the description of the approach used to estimate the emissions provided in the NIR is not correct. The Party does not use the COPERT model for the estimation of emissions from road transportation, but instead uses a "COPERT-like approach". The ERT recommends that Turkey correct the description in the NIR of the method used to estimate the CO_2 emissions, as well as the method used to estimate the CH_4 and N_2O emissions from this category. The ERT also reiterates the recommendations made in previous review reports that the Party provide information on all the EFs, assumptions and AD used in developing the country-specific method, in order to improve the transparency of its reporting.

4. Non-key categories

Oil and natural gas – CO_2, CH_4 and N_2O

31. The ERT commends Turkey for reporting CO_2, CH_4 and N_2O emissions from oil and natural gas for the entire time series, which were reported as "NE" for all years except 2010 in the previous inventory submission. However, in addition to CH_4 emissions from natural gas distribution (as explained in para. 32 below), emissions from some subcategories were still reported as "NE", including: CO_2 and CH_4 emissions from distribution of oil products; CO_2 emissions from natural gas distribution; fugitive CO_2 and CH_4 emissions from combined oil and gas venting; and CO_2, CH_4 and N_2O emissions from combined oil and gas flaring. In response to a question raised by the ERT during the review, Turkey explained that it does not have any AD and, therefore, the emissions have not been calculated. The ERT recommends that Turkey collect the necessary AD, and estimate and report the emissions from the subcategories currently reported as "NE" using the default EFs provided in the IPCC good practice guidance, as recommended in the previous review report, in order to improve the completeness of its inventory.

32. As mentioned in paragraph 31 above, Turkey has reported the fugitive emissions of CH_4 from natural gas distribution as "NE", for which the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the IPCC good practice guidance provide estimation methods. Since Turkey has reported emissions from natural gas transmission, it is possible that emissions from natural gas distribution may also occur. In response to the questions raised by the ERT during the review, the Party informed the ERT that it has made efforts to calculate CH_4 emissions from natural gas distribution; however, the results of these calculations have big uncertainties, thus Turkey is currently trying to decrease the uncertainties by improving the AD and EFs for this category. The ERT strongly recommends that Turkey report fugitive CH_4 emissions from this subcategory.

33. Turkey reported in the NIR that the uncertainties for the EFs and fuel consumption are determined by experts from MENR; however, the actual values of the uncertainties estimated by the experts were not provided. Additional information, such as the basis of the expert judgement used, was not provided in the NIR. During the review, the ERT requested that Turkey clarify how the expert judgement was derived, and provide documentation on the expert judgement used. However, the Party did not provide the ERT with any additional explanations, except for a reference to annex 7 to the NIR, in which the description is neither sufficiently detailed nor clear for the ERT to review the justification of the uncertainty values. The ERT recommends that Turkey provide a detailed explanation of the expert judgement used for the uncertainties for the EFs and AD following the guidance provided in chapter 6 (quantifying uncertainties in practice) of the IPCC good practice guidance. The ERT also encourages Turkey to include separate sections for each category in the NIR describing any uncertainty-related issues.

C. Industrial processes and solvent and other product use

1. Sector overview

34. In 2011, emissions from the industrial processes sector amounted to 56,205.77 Gg CO_2 eq, or 13.3 per cent of total GHG emissions, and CO_2 and N_2O emissions from the solvent and other product use sector were reported as "NE" or "NA". Since 1990, emissions have increased by 264.0 per cent in the industrial processes sector. The key drivers for the rise in emissions in the industrial processes sector are the increases in emissions from cement production and iron and steel production. Within the industrial processes sector, 56.9 per cent of the emissions were from mineral products, followed by 31.8 per cent from metal production and 11.1 per cent from consumption of halocarbons and SF_6. The remaining 0.2 per cent were from chemical industry.

35. Turkey has reported the emissions, AD and implied emission factors (IEFs) for several categories using the notation key "C". In response to a question raised by the ERT during the review, the Party explained that emissions from the categories reported as "C" have not been included in the inventory. However, this leads to an underestimation of emissions from the industrial processes sector, and is not in line with the UNFCCC reporting guidelines. The ERT considers that many of the emissions from the subcategories reported as "C" can be reported by aggregating those subcategories at a higher level. The ERT strongly recommends that Turkey report emissions from the categories with confidential data to improve the completeness of its inventory, including for:

(a) CO_2 emissions from soda ash production and use;

(b) CO_2 emissions from ammonia production;

(c) N_2O emissions from nitric acid production;

(d) CO_2 emissions from calcium carbide production;

(e) CH_4 emissions from other chemical processes such as carbon black, ethylene (and CO_2), dichloroethylene, styrene and methanol production (see para. 50 below);

(f) CO_2 and PFC emissions from aluminium production;

(g) SF_6 used in aluminium foundries (see para. 54 below).

36. The ERT notes that the methods, EFs and AD used for the emission estimates are not well documented in the NIR. The ERT also notes that the information on the sector-specific QA/QC activities are not well documented. The ERT recommends that Turkey improve its documentation on the industrial processes sector inventory by providing a clear explanation of the methods, EFs, and AD applied for all categories, especially for the key categories, as well as the detailed information on the sector-specific QA/QC activities for the industrial processes sector in the NIR.

2. Key categories

Cement production – CO_2

37. Turkey has estimated CO_2 emissions from cement production based on the aggregated country-specific clinker production data from the Turkish Cement Manufacturers' Association. Default values for the calcium oxide (CaO) content of clinker (a weight fraction of 65.0 per cent), which result in an EF of 0.51 t CO_2/t clinker, and a correction factor of 1.02 for cement kiln dust (CKD) were applied for all years of the time series. Since cement production is a key category, the ERT reiterates the recommendation made in the previous review report that Turkey develop a country-specific EF by using

plant-specific data to better reflect the technological developments in this category. In response to a question raised by the ERT during the review, Turkey informed the ERT about the possibility of obtaining plant-specific CaO and CKD values following the introduction of new legislation on the monitoring and reporting of GHGs, which would oblige cement industries to report their GHG emissions. However, that new legislation would enter into force by 2015. The ERT therefore strongly reiterates the recommendation made in the previous review report that Turkey further evaluate the possibility of collecting plant-specific data, and use country-specific EFs in its estimate of CO_2 emissions from cement production.

38. The ERT considers that there is still significant room for improvement regarding the Party's reporting of CO_2 emissions from cement production. For example, a greater use of tables and/or graphics concerning the time series of CO_2 emissions, EFs and clinker (AD) would help to improve the transparency of Turkey's reporting. The ERT recommends that Turkey consider the use of various measures, such as the provision of information in a tabular format, to improve its inventory documentation.

Lime production – CO_2

39. Turkey has estimated CO_2 emissions from lime production using a tier 1 method with AD obtained from the Turkish Lime Association. In the NIR, Turkey reported that a tier 1 EF was used for the emission estimates, and the value used (0.75 kg CO_2/t) was provided in the table on EFs in annex 2 to the NIR. However, no background information on the choice of the EF was provided in the NIR. In response to a question raised by the ERT during the review, the Party informed the ERT that 95 per cent of total lime production in Turkey is high-calcium lime, and that the EF of 0.75 kg CO_2/t, which is the IPCC default value for high-calcium lime, was used for the estimates. The ERT recommends that Turkey include a clear description of the EF used, including information on the respective types of lime produced, in the NIR to improve the transparency of its reporting. The ERT also noted that the recommendations made in the previous review report included that Turkey correct the units used for the EF from kg CO_2/t to t CO_2/t in the table on EFs in annex 2 to the NIR; however, this typographical error has not been corrected in the 2013 NIR. The ERT recommends that Turkey address the recommendation made in previous review reports to correct the error in the units used for the EF.

40. Turkey has reported CO_2 emissions from limestone and dolomite use as "IE" and has included them under CO_2 emissions from lime production, due to confidentiality concerns associated with calculating the emissions from limestone and dolomite use. These emissions have been reported with lime production for 2001 onwards, leading to large fluctuations in the IEF over the time series. Therefore, the ERT again reiterates the recommendations made in previous review reports that Turkey include a detailed rationale for the fluctuations in the IEF including the uses of limestone and dolomite, such as glass production. The ERT also recommends that Turkey provide an explanation of how time-series consistency is ensured.

Iron and steel production – CO_2

41. Turkey applied tier 2 and plant-specific data to estimate CO_2 process emissions from iron and steel production separately from the emissions from fuels used for energy, but for the years 2010 and 2011 only. For the years 1990–2009, the Party reported CO_2 emissions as "IE" and "NA" in CRF table 2(I). Turkey explained in the NIR that process emissions for the period 1990–2009 are included under the category iron and steel in the energy sector. Applying a different allocation of emissions from iron and steel industry across the time series is not in line with the IPCC good practice guidance. Turkey also stated in the NIR that the studies to collect the necessary AD to estimate the emissions for the years prior to

2010 are ongoing. The ERT reiterates the recommendation made in the previous review report that the Party recalculate the iron and steel process emissions for the entire time series, allocating the emissions in accordance with the IPCC good practice guidance. The ERT also recommends that Turkey describe in the NIR an emissions trend analysis once the entire time series of iron and steel production process emissions has been estimated.

42. Turkey reported CO_2 emissions from coke as "NA" for the years 1990–2004, and "IE" for the years 2005–2009, and reported actual emissions for 2010–2011 in CRF table 2(I).A–G. While CRF table 2(I).A–G shows information on CO_2 emissions from coke production, the ERT noted that clear information was not provided in the NIR on the coke production emissions allocated under iron and steel (manufacturing industries and construction) in the energy sector. In response to a request from the ERT during the review to provide a carbon balance, Turkey explained that CO_2 emissions from coke reported under the category iron and steel production refer to coke consumption as a reducing agent used in blast furnaces, not from coke production. However, the ERT notes that this is not in line with the IPCC good practice guidance. The ERT recommends that Turkey reallocate CO_2 emissions from coke consumption to iron production, and clearly explain the reallocation in the NIR in order to improve the transparency of its reporting. Further, the Party explained that the emissions from iron production are included in the steel production emissions; however, this explanation is not sufficiently clear for the ERT to understand the situation. Although Turkey explained that all emissions reported under the category coke production (amounting to 13,530.57 Gg CO_2 eq) are actually the emissions from coke consumption as explained above, there is no justification in the NIR for reporting no emissions from coke production. CO_2 emissions from sinter are reported as "NA"; however, no justification has been provided for this in the NIR or in the Party's response to a question raised by the ERT during the review. The information provided is not sufficiently clear for the ERT to understand whether or not there are emissions from those subcategories, as long as other reducing agents are consumed in blast furnaces. Therefore, the ERT encourages Turkey to provide a qualitative carbon balance showing carbonaceous inputs and outputs to clearly demonstrate which reducing agents and fuel sources are consumed for sinter, iron and steel productions.

Consumption of halocarbons and SF_6 – HFCs

43. Turkey reported that HFC-134a emissions from refrigeration and air-conditioning equipment is a key category. This is the only subcategory for which Turkey reported emissions under the category consumption of halocarbons and SF_6. In estimating HFC-134a emissions, Turkey used a tier 1 method based on raw import data provided by TurkStat, which is not in line with the IPCC good practice guidance. The ERT reiterates the recommendation made in the previous review report that Turkey use a higher-tier method, namely by using data on the annual sales of HFC-134a, or by collecting equipment data to apply specific EFs representing each equipment type, to estimate these emissions.

44. If Turkey is not able to collect the necessary data to implement a higher-tier method, the ERT reiterates the recommendation made in previous review reports that the Party improve the transparency of its reporting by including more detailed information on the AD used, such as whether they include only the import of raw gas or also the gas in products, and by more clearly explaining the method used to estimate the emissions for this category, including whether a bottom-up or top-down approach, as described in the IPCC good practice guidance, was used.

3. Non-key categories

Soda ash production and use – CO_2

45. Turkey continues to report the emissions from soda ash production as "C", and has not included them under any other categories (see para. 35 above), in spite of the recommendation made in the previous review report. The ERT reiterates the recommendation made in the previous review report that Turkey estimate the emissions from the categories that are subject to confidentiality restrictions and report them under another category, for example under other (mineral products) in the next inventory submission, at an aggregated level. If it is not possible to report the emissions from those categories, the ERT also reiterates the recommendation made in the previous review report that Turkey correct the notation key used from "C" to "NE".

46. The ERT notes that in annex 2 to the NIR Turkey has reported the CO_2 EF for soda ash use (0.415 t CO_2/t soda ash used) only, but no EF for soda ash production has been reported in the NIR. However, in CRF table 2(I).A–G, CO_2 emissions from soda ash use have been reported as "NA". In response to a question raised by the ERT during the review, Turkey provided the CO_2 EF (0.097 t CO_2/t of trona) for soda ash production; however, the Party indicated that the emissions from soda ash production have not been included in the inventory. The ERT recommends that Turkey provide the CO_2 EF for soda ash production and ensure the consistency of its reporting within the NIR and between the NIR and the CRF tables.

Ammonia production – CO_2

47. Turkey continues to report the CO_2 emissions from ammonia production for the period 1990–2006 only. The emissions have been reported in CRF table 2(I) as "C" for the period 2007–2011, with the exception of 2009. Turkey explained that ammonia production was zero in 2009, and that the notation key "NO" (not occurring) rather than "NA" was therefore reported in CRF table 2(I).A–G for 2009. The ERT recommends that Turkey report the emissions at an aggregated level, for example by including them under the category other (chemical industry) along with all other chemical emissions, and report the emissions as "IE" under ammonia production. This would allow Turkey to comply with Turkish Statistics Law No. 5429, under which the production data for those categories are confidential, while also ensuring conformity with the UNFCCC reporting guidelines.

Nitric acid production – N_2O

48. Turkey reported N_2O emissions from nitric acid production as "C" for 2007 onwards. N_2O emissions for 2006 are reported as 3,027.83 Gg CO_2 eq, and for the period 1990–2006 the emissions trend is unstable, ranging from 128.08 Gg CO_2 eq for 1990 to 5,099.33 Gg CO_2 eq for 1995. As explained in paragraph 35 above, Turkey has not included N_2O emissions from nitric acid production under other (chemical industry), although the previous review report recommended that the Party do so. In response to a question raised by the ERT during the review, Turkey explained that it is not sure how to aggregate N_2O emissions from nitric acid production into other categories, as there is only one source of N_2O under chemical industry. As a solution to this issue, the ERT recommends that Turkey report N_2O emissions from nitric acid production aggregated under other (industrial processes) and provide proper explanations in the NIR. If this is not possible, the ERT recommends that Turkey correct the notation key used to "NE". Additionally, the ERT notes that, in the NIR, it is not clear whether or not the Party used the IPCC default EF of 19 kg N_2O/t HNO_3 to estimate the emissions from plants with non-selective catalytic reduction (NSCR) abatement technology. The ERT recommends that Turkey provide an

explanation for the choice of EF used to estimate N_2O emissions from nitric acid production and provide a description of the number of plants that have NSCR technology.

Calcium carbide production – CO_2

49. Turkey reported CO_2 emissions from calcium carbide production for the period 1990–2004; however, the Party reported the notation key "NO" for the period 2005–2008, and "C" for the period 2009–2011. The ERT noted that, in the NIR, Turkey has not clearly indicated whether CO_2 emissions from calcium carbide production are included in the national total emissions. In response to a question raised by the ERT during the review, Turkey provided the estimates of CO_2 emissions from this category. However, the Party also explained that due to the confidentiality issue regarding the emissions from calcium carbide production, it was not possible to include these emissions in the inventory. The ERT recommends that Turkey report these emissions and provide descriptions of the methods and data used. The ERT considers that the emissions can be reported under other (chemical industry), for example at an aggregated level, and that the notation key "IE" could be used to report emissions from calcium carbide production. This would allow Turkey to comply with the national confidentiality requirements of the above-mentioned Law No. 5429 (see para. 47 above), while also ensuring conformity with the UNFCCC reporting guidelines.

Other (chemical industry) – CH_4

50. According to the NIR, emissions from the following processes are reported under other (chemical industry): carbon black, ethylene, dichloroethylene, styrene and methanol production. These emissions are estimated using a tier 1 method provided in the Revised 1996 IPCC Guidelines and industrial production statistics from TurkStat. In CRF table 2(I).A–G, CH_4 emissions from those categories are reported at an aggregated level. In order to improve the transparency of the inventory, the ERT recommends that Turkey report these emissions separately under each subcategory and transparently describe, in the NIR, the EFs and AD used in the calculations. Further, the ERT noted that the AD for styrene were reported as "NA" in CRF table 2(I).A–G but the emissions were reported as "IE". In response to a question raised by the ERT during the review, Turkey agreed that the notation key "IE" is correct since the emissions from styrene are aggregated with the emissions from other subcategories. The ERT recommends that Turkey correct the use of the notation key from "NA" to "IE".

Ferroalloys production – CO_2

51. The ERT noted that, in the NIR, it is not clearly explained whether process-related emissions from ferroalloys production are reported under the industrial processes sector or under the energy sector and which method is used to estimate CO_2 emissions from this category. In response to a question raised by the ERT during the review, Turkey explained that emissions from fuel consumption are reported in the energy sector under manufacturing industries and construction (energy). Turkey also assured the ERT that a tier 1 method from the Revised 1996 IPCC Guidelines was used. In order to improve the transparency of the inventory, the ERT recommends that Turkey clearly describe in the NIR where combustion and process-related emissions are reported and also describe the method, EFs and AD used.

Aluminium production – CO_2 and PFCs

52. Turkey reported CO_2 emissions from aluminium production as "C" in CRF table 2(I).A–G and PFC emissions as "C" in CRF table 2(II)s1. In the NIR, the Party explained that CO_2 emissions from this category are considered to be small. However, the ERT is of

the view that this is not in line with the IPCC good practice guidance. The ERT notes that there is no clear information in the NIR regarding PFC emissions. However, the ERT further notes that Turkey has reported PFC emissions at a higher, more aggregated level under consumption of halocarbons and SF_6 for the period 1990–2006, and as "C" for 2007 onwards and has excluded them from the inventory when confidentiality is justified under Law No. 5429 (see para. 47 above). The ERT recommends that Turkey estimate and reallocate PFC emissions from the category consumption of halocarbons and SF_6 to aluminium production for the entire time series, and report both CO_2 and PFC emissions from aluminium production under this category or alternatively at an aggregated level. The ERT also recommends that Turkey, following the inclusion of those emissions in the inventory, reassess its key category analysis. The ERT further recommends that the Party clearly describe the methods, EFs and AD used for both CO_2 and PFC emissions, in order to improve the transparency of its reporting.

53. In response to questions raised by the ERT during the review, Turkey informed the ERT about a planned project entitled "Support to the Mechanism for Monitoring Turkey's Greenhouse Gas Emissions". Within the scope of this project, a fully functioning monitoring mechanism of GHG emissions is to be established in Turkey in line with European Union decision 280/2004/EC concerning a mechanism for monitoring Community GHGs and for implementing the Kyoto Protocol, and its revised version, decision 525/2013/EC. Following its introduction, all AD related to PFCs will be collected in a detailed way. The ERT commends Turkey for its efforts and recommends that the Party implement this data collection project and increase the overall data quality of the inventory.

SF_6 used in aluminium and magnesium foundries – SF_6

54. Turkey has reported in the NIR that data on SF_6 used in aluminium and magnesium foundries are confidential; however, in CRF table 2(II).C, SF_6 emissions from aluminium foundries have been reported as "NE", and emissions from magnesium foundries have been reported as "NA". The ERT strongly reiterates the recommendation made in the previous review report that Turkey estimate and report these emissions, and if necessary due to confidentiality concerns, report them at an aggregated, higher level.

D. Agriculture

1. Sector overview

55. In 2011, emissions from the agriculture sector amounted to 28,833.07 Gg CO_2 eq, or 6.8 per cent of total GHG emissions. Since 1990, emissions have decreased by 5.1 per cent. The key driver for the fall in emissions is the decrease in the number of livestock. Within the sector, 60.0 per cent of the emissions were from enteric fermentation, followed by 24.9 per cent from agricultural soils, 13.5 per cent from manure management, 0.9 per cent from field burning of agricultural residues and 0.7 per cent from rice cultivation.

56. The ERT reiterates the recommendation made in the previous review report that Turkey further elaborate on the contribution of gases and subcategories within the agriculture sector to total sectoral emissions, and document the percentage contribution of the gases and subcategories to total national emissions, in order to improve the transparency of the reporting of the emission trends.

57. The AD for the GHG inventory of the agriculture sector are provided by TurkStat and the Ministry of Food, Agriculture and Livestock, and the temperature data are taken from the General Directorate of Meteorology. In response to a question raised by the ERT during the review, Turkey provided the ERT with the website addresses of these institutions. The ERT recommends that the Party include such website references in the NIR. In

addition, the ERT recommends that Turkey provide, in the NIR, information on the data sources for the agricultural statistics by source category, in order to improve the transparency of its reporting.

58. The ERT noted that the population size for cattle, sheep and swine reported in the CRF tables are different from the data provided by the Food and Agriculture Organization of the United Nations (FAO). In response to a question raised by the ERT during the review, Turkey explained that the FAO data are updated and used one year later than the AD used for the GHG inventory, therefore the AD used for the GHG inventory are more accurate compared with the FAO data. Moreover, FAO uses some assumptions, and the main source of FAO data is TurkStat data. The ERT recommends that Turkey explain, in the NIR, the reasons for the differences between the AD used for the GHG inventory and the FAO data.

59. During the review week, the ERT noted that the total number of cattle reported in the NIR was different from the number reported by TurkStat for 2011. Turkey replied that the emissions inventory data are collected between September 2012 and February 2013; however, in June 2013, there was a revision. The ERT recommends that Turkey update the AD and recalculate the emissions in the relevant categories in its next inventory submission.

60. In the 2013 inventory submission, Turkey has reported N_2O emissions from pasture, range and paddock and indirect emissions for the complete time series for the first time, whereas the emissions were reported for 2010 only in the Party's 2012 inventory submission. The ERT commends Turkey for its efforts to improve the completeness of its inventory following the recommendations made in the previous review report.

61. In the previous review report, the ERT recommended that Turkey provide more transparent information in annexes 3 and 7 to the NIR, including information on the sources of the uncertainties, any issues affecting time-series consistency, and category-specific QA/QC and verification procedures for all categories in the agriculture sector. As no additional information has been reported in the 2013 inventory submission, the ERT reiterates the recommendation made in the previous review report. Further, the ERT recommends that the Party provide tables showing the time series for the EFs, AD and emissions by source category, as well as detailed documentation supporting the choice of EFs, including when default EFs are applied in order to improve the transparency of its inventory reporting.

62. The recommendations made in the previous review report included that Turkey provide information on category-specific planned improvements in its inventory submission. In response to a request made by the ERT during the review to provide information on those issues, Turkey explained that the inventory quality will be updated by applying a QA/QC plan and that the plan is almost ready for application. However, there was no information on a category-specific improvement plan in its response. The ERT reiterates the recommendation made in the previous review report that Turkey provide information on category-specific planned improvements for the agriculture sector.

2. Key categories

Enteric fermentation – CH_4

63. The ERT noted that the CH_4 emissions from enteric fermentation for 2011 (17,305.45 Gg CO_2 eq) are 9.3 per cent higher than for 2010 (15,833.17 Gg CO_2 eq), and that the CH_4 emissions from enteric fermentation fluctuate over the time series. In response to questions raised by the ERT during previous stages of the review, Turkey explained that the number of animals had been decreasing; however, due to governmental support, the number of animals has been increasing since 2009, thereby resulting in the inter-annual

fluctuations. The ERT recommends that Turkey include this information in the NIR to increase the transparency of its reporting.

64. Turkey continues to use a tier 1 method to estimate emissions from livestock categories using the default EFs from the Revised 1996 IPCC Guidelines in consideration of different climatic regions in Turkey. For dairy cattle (culture) an average value from the IPCC default values for Asia and Eastern Europe (68.5 kg CH_4/head/year) was used, while for dairy cattle (domestic) the IPCC default value for Asia (56.0 kg CH_4/head/year) was chosen. In response to a request made by the ERT during the review to provide documentation supporting the choice of EFs, Turkey explained that the average value was based on expert judgement. The ERT recommends that Turkey provide documentation supporting the expert judgement (e.g. country-specific studies, research articles, etc.). In addition, the ERT recommends that Turkey provide the disaggregated time-series data for cattle (culture and domestic). However, because CH_4 emissions from enteric fermentation is a key category, the ERT reiterates the recommendation made in the previous review reports that Turkey estimate the emissions from significant livestock categories using a tier 2 method in accordance with chapter 4.1 of the IPCC good practice guidance.

65. Further to the point raised in paragraph 64 above, the ERT noted that Turkey has not presented national data on the milk productivity of dairy cattle in the NIR following the recommendation made in the previous review report for the purpose of verifying the selection of relevant default EFs from the Revised 1996 IPCC Guidelines. The ERT reiterates the recommendation made in the previous review report that Turkey provide national data on milk productivity from an official source.

66. For sheep (domestic) Turkey has used an IPCC default EF for developing countries (5.0 kg CH_4/head/year), while for sheep (merinos) it has used an average value (6.5 kg CH_4/head/year) from the IPCC default EF for developing countries (5.0 kg CH_4/head/year) and developed countries (8.0 kg CH_4/head/year). In response to questions raised during previous stages of the review, Turkey informed the ERT that the weight of sheep (domestic) is considerably lower compared to sheep (merinos), and that the application of the average value from the IPCC default EFs for developing and developed countries was determined by expert judgement. In response to a request made by the ERT during the review to provide supporting material and a time series of the number of animals, Turkey provided the ERT with the population size for sheep (domestic) and sheep (merinos) separately but without specifying the particular year represented by those values. The Party also explained that the arithmetical averages have been used for the calculation. The ERT recommends that Turkey provide disaggregated time-series data for sheep (domestic, merinos) and relevant documentation supporting the choice of the average IPCC default EFs for sheep (merinos) (6.5 kg/head/year).

Manure management – CH_4 and N_2O

67. Turkey estimated CH_4 emissions from manure management using a tier 1 method and default EFs. The ERT noted that the IEF for CH_4 emissions from dairy cattle fluctuates over the entire time series (ranging from 8.2 kg/head/year in 1992 to 10.6 kg/head/year in 1999). In response to a question raised by the ERT during the review, Turkey explained that the fluctuations are linked to the variation in the number of animals. The ERT recommends that the Party provide an explanation of the fluctuation. Further, since CH_4 emissions from manure management is a key category, the ERT recommends that Turkey estimate the CH_4 emissions using a tier 2 method with country-specific EFs for its animal species/categories in accordance with the IPCC good practice guidance, and reiterates the recommendation made in previous review reports that Turkey estimate the emissions from significant livestock categories using a tier 2 method.

68. Turkey estimated N_2O emissions from manure management using IPCC default EFs. The ERT noted that in CRF table 4.B(b) for N_2O emissions from liquid systems, the Party reported solid storage and dry lot, and other animal waste management systems and their IEFs as "NO" and "NA", and the emissions from daily spread were reported as "NE". This issue was raised in previous review reports which recommended that Turkey include documentation on the N_2O emissions per manure management system, or information on the distribution of the manure management systems used for the different animal groups. However, that information has not been provided in the 2013 inventory submission. In response to a question raised by the ERT during the review, Turkey provided a table with disaggregated emissions and EFs by animal category. The ERT recommends that the Party compile CRF table 4.B(b) and CRF table 4.B(a) for CH_4 emissions using appropriate information on animal waste management system data and IEFs.

Direct soil emissions – N_2O

69. Turkey reported in the NIR that N_2O emissions from synthetic fertilizers are estimated using a tier 1 method and default EFs (0.01 kg N_2O/kg N). The ERT notes that the N_2O IEF for synthetic fertilizers for all years of the time series (6.36 kg N_2O-N/kg N) is much higher than the IEF used by other reporting Parties (ranging from 0.005 kg N_2O-N/kg N to 0.014 kg N_2O-N/kg N for 2011). In response to a question raised by the ERT during the review, Turkey informed the ERT that it has noted this issue and that it would be evaluated in the next year. The ERT recommends that Turkey complete its evaluation of the accuracy of its N_2O emission estimates for this category, recalculate the N_2O emissions, if appropriate, and report the results in its inventory submission. The ERT also recommends that Turkey move to a tier 2 approach in accordance with the IPCC good practice guidance, considering that this is a key category.

3. Non-key categories

Rice cultivation – CH_4

70. Turkey has applied an IPCC tier 1 approach with default EFs to estimate CH_4 emissions from rice cultivation. Since 1990, CH_4 emissions from rice cultivation have increased by 87.5 per cent (208.74 Gg CO_2 eq for 2011). In the NIR, Turkey explained that the rice harvested area data are taken from agricultural statistics provided by TurkStat, and that rice cultivation with intermittently flooded single aeration (single aeration) is applied in Turkey. In response to a request made by the ERT during the review to provide documentation supporting this assumption, the Party explained that the TurkStat experts know how rice is cultivated from the field surveys and data collection; however, no supporting documentation was provided. The ERT recommends that Turkey include a time series of the harvest areas, the actual values of the EFs used for the emission estimates and the documented information used to determine the harvested area data in the NIR.

E. Land use, land-use change and forestry

1. Sector overview

71. In 2011, net removals from the LULUCF sector amounted to 43,640.26 Gg CO_2 eq. Since 1990, net removals have increased by 183.7 per cent. The key driver for the rise in removals is the increase in removals from forest land remaining forest land. Within the sector, net removals of 61,795.58 Gg CO_2 eq were from forest land, followed by net emissions of 14,757.72 Gg CO_2 eq from cropland and 3,377.96 Gg CO_2 eq from grassland. The remaining net emissions of 19.64 Gg CO_2 eq were from wetlands.

72. Turkey has reported in the 2013 inventory submission estimates of the carbon stock changes for some pools that were not included in the 2012 inventory submission, including the carbon stock changes in: mineral and organic soils in cropland remaining cropland; living biomass and mineral soils in grassland converted to cropland; living biomass and soil carbon in grassland remaining grassland; and living biomass and soil carbon in cropland converted to grassland. Turkey has also used more country-specific data in order to improve the quality of the inventory estimates. However, estimates of the carbon stock changes for a number of mandatory reporting categories are still missing from the Party's inventory (see table 3 above). The ERT commends Turkey for the improvements made in the 2013 inventory submission, but recommends that the Party report estimates of the carbon stock changes for all mandatory land-use categories and pools, and provide further information, including on the estimation methods, AD and assumptions used, if any, in the NIR. The ERT also notes that, in CRF table 5(V) for biomass burning, CO_2 emissions from wildfires under forest land remaining forest land are reported as "IE", although emissions of non-CO_2 gases are reported. However, no explanation is provided in the NIR or the CRF tables. In addition, while CO_2 emissions from agricultural lime application in CRF table 5(IV) are reported as "NE", the NIR states that limestone application does not occur on agricultural lands and grassland. The ERT recommends that the Party ensure the appropriate use of the notation keys in the CRF tables and provide transparent justification for the notation keys used in a consistent manner in the NIR.

73. For the 2013 inventory submission, Turkey has changed the land-use database from the one consolidated from three different sets of map types (Land Use 1980, CORINE 2000, CORINE 2006, Statip 2010) to a single source (CORINE 1990, 2000, 2006), in order to make the time series more consistent and reliable. Area data from temporal time points using CORINE land-cover information for 1990, 2000 and 2006 were used to estimate the areas of land use and land-use change for the land categories other than forest land. However, this methodology resulted in steep and unrealistic fluctuations in the emissions and removals and, consequently, in the IEFs across the time series. For example, for land converted to cropland, the net CO_2 removals remain constant at 2,028.89 Gg CO_2 eq during the period 1990–1999; 5,252.22 Gg CO_2 eq during the period 2000–2006; and 3,356.16 Gg CO_2 eq during the period 2007–2011, with steep changes across the years 1999–2000 and 2006–2007. The ERT recommends that Turkey re-examine its land-use data source and explore the possibility of obtaining a more consistent time series of land-use and land-use change data for estimating the emissions and removals.

74. Turkey has made efforts to improve the transparency of its submission by including in the NIR additional information on the methods, assumptions, EFs, AD and data sources used following the recommendations made in previous review reports. However, the ERT notes that the NIR still lacks transparent information on many categories, for example on the methodology used in the estimation of the carbon stock changes in the soil carbon pools in cropland remaining cropland, and on the EFs and parameters used for the emission and removal estimates related to land converted to grassland (see paras. 83, 84 and 87 below). The ERT reiterates the recommendation made in previous review reports that Turkey improve the transparency of its documentation in the NIR on the estimation methodologies used for the different land-use categories by including transparent information on the AD, EFs, other parameters and underlying assumptions used in the inventory methodologies in the next inventory submission, following the outline of the NIR as laid out in the UNFCCC reporting guidelines.

75. The ERT noted that Turkey explained, in the NIR, the planned improvements for future inventory submissions to improve the national land use and land-use change information. The ERT welcomes these planned improvements and reiterates the recommendation made in the previous review report that Turkey provide additional information on the progress made to date to improve the system for the complete

representation of land areas in its NIR. In addition, the ERT recommends that the Party make efforts to develop and provide a complete set of annual land-use change matrices for the period 1990–2012 in the next inventory submission. The ERT also noted that Turkey stated in the NIR that it is planning to finalize the country-specific QA/QC plan for the LULUCF sector as well as the other sectors, since this is one of the areas of its planned inventory improvements. However, no concrete information on the sector-specific QA/QC activities for the LULUCF sector was provided in the NIR of the 2013 inventory submission. The ERT recommends that Turkey include detailed information on the sector-specific QA/QC activities for the LULUCF sector in the NIR.

2. Key categories

Forest land remaining forest land – CO_2

76. In the NIR, Turkey has reported the total forest area as 21,678.13 kha for 2011, of which 10,119.47 kha is degraded forests. The ERT welcomes the improvement in the transparency of the areas reported under forest land remaining forest land and the provision of consistent data between the NIR and the CRF tables following the recommendation made in the previous review report.

77. In the NIR, the carbon stock changes for 2011 in the living biomass and dead organic matter pools are reported under four subdivisions: managed coniferous, managed deciduous, unmanaged coniferous and unmanaged deciduous forests. In the CRF tables, however, there is no disaggregation of the forest land remaining forest land category into any of these forest types. Also in the NIR, the annual area changes and annual volume increment for the period 1972–2011 are reported under the following subdivisions: normal high forests, degraded high forests, normal coppices and degraded coppices, based on data from the Party's forest resources inventory system called ENVANIS. The ERT reiterates the recommendation made in the previous review report that Turkey consistently use the same subcategories in both the NIR and the CRF tables and explain the methods and factors used for the estimation of the carbon stock changes in degraded forests, in order to improve the transparency and consistency of its reporting.

78. Turkey used the stock change approach (tier 2 method) with country-specific EFs for the calculation of the biomass gains in forest land remaining forest land. However, the NIR refers to the use of the gain–loss (default) method to estimate the biomass losses. Further, Turkey explained in the NIR that the annual carbon stock changes in living biomass are calculated using equation 3.2.3 from the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF), which estimates the annual carbon stock changes in living biomass (the stock change method), equation 3.2.5, which estimates the average annual increment in biomass (the default method), and equation 3.2.6, which estimates the annual decrease in carbon stocks due to biomass loss (the default method). This issue was raised in the previous review reports because the combination of methods used by the Party could result in the double counting of biomass losses since the stock change method inherently includes the annual carbon stock gains and losses. In response to a question raised by the ERT during the review, Turkey explained that the carbon stock changes in living biomass are calculated by adding formulations of the IPCC good practice guidance for LULUCF to the ENVANIS database worksheet. The ERT considers that it is still not clear how the above-mentioned methods are applied, and that Turkey has not addressed the recommendations made in the previous review reports on this issue. The ERT therefore reiterates the recommendations made in the previous review reports that Turkey provide clear and transparent documentation on the estimation of the carbon stock changes in living biomass in the NIR.

79. The recommendations in previous review reports included that Turkey provide complete and transparent documentation on how the input parameter for the average annual transfer into dead wood is calculated and applied, owing to concerns that there was a possible overestimation of the carbon accumulation in dead wood. This concern arises from the observed fluctuations in the carbon stock changes in the dead organic matter pool (e.g. a doubling between 2007 and 2008 from 1,029.38 Gg C to 2,371.08 Gg C). Turkey has not provided any further explanation of this issue in the 2013 inventory submission. The ERT reiterates the recommendation made in the previous review report that the Party provide complete and transparent information on how the carbon stock changes in the dead organic matter pool are calculated by presenting the equations, parameters and other data used in the calculation in its NIR.

80. In the NIR, Turkey stated that there were insufficient data to calculate the carbon stock changes in the litter pool and, therefore, this pool was assumed to be zero in line with the tier 1 method from the IPCC good practice guidance for LULUCF. However, the IPCC good practice guidance for LULUCF encourages the reporting of the carbon stock changes in the litter pool to reflect the national circumstances and where management could influence these carbon stock changes. The ERT recalls its encouragement made in the previous review report that Turkey apply a tier 2 approach for estimating the carbon stock changes in the litter pool (i.e. using equation 3.2.13 and default litter data from table 3.2.1 of the IPCC good practice guidance for LULUCF and the areas of the four climate zones identified in the NIR) and provide transparent information on the method, AD and assumptions used, if any, in the NIR.

81. Turkey has not included estimates of the carbon stock changes in soils for forest land remaining forest land and has used the notation keys "NE" for mineral soils and "NO" for organic soils. In the NIR, Turkey explained that the carbon stock changes in soils were not estimated due to a lack of adequate data and the inapplicability of the default values provided in the IPCC good practice guidance for LULUCF to reflect Turkey's national circumstances. The ERT notes that, according to the NIR, Turkey has prepared a plan to address this issue. In response to a question raised by the ERT during the review regarding the status of the implementation of this plan, the Party explained that the issue has not yet been addressed, and that estimates of the carbon stock changes in soils will not be available in the 2014 inventory submission. The ERT welcomes the fact that Turkey has prepared a plan to address this issue, as stated in the NIR, and recommends that the Party provide estimates for the carbon stock changes in soils in a future inventory submission.

Land converted to forest land – CO_2

82. Turkey reported the carbon stock changes in living biomass and dead organic matter for land converted to forest land. However, Turkey did not include any estimates for the carbon stock changes in soils for this category, and used the notation key "NO", except for grassland converted to forest land where the notation key "NE" was used. In the NIR, Turkey explained that the carbon stock changes in soils were not estimated due to a lack of adequate data. The ERT notes that, according to the NIR, Turkey has prepared a plan to address this issue. In response to a question raised by the ERT during the review regarding the status of implementation of this plan, the Party explained that the issue has not yet been addressed, and that estimates of the carbon stock changes in soils will not be available in the 2014 inventory submission. Also, Turkey explained that the notation key "NE" should be used to report the soil carbon stock changes in cropland converted to forest land and grassland converted to forest land. The ERT welcomes the fact that Turkey has prepared a plan to address this issue, as stated in the NIR, and recommends that the Party provide estimates for the carbon stock changes in soils in a future inventory submission.

Cropland remaining cropland – CO_2

83. Turkey has reported the carbon stock changes in the above-ground biomass, below-ground biomass and soil carbon pools in cropland remaining cropland. The Party has used a combination of tier 1 and tier 2 methods with some country-specific values together with IPCC defaults. For example, Turkey explained in the NIR that a combination of tier 1 and tier 2 methods using a combination of IPCC default factors and country-specific factors was applied to calculate the biomass increase for perennial cropland using the gain–loss method. In response to a recommendation made in the previous review report, Turkey has included some additional information on the types of perennial crops and the methodology and data used in the estimation of the carbon stocks in biomass for perennial crops. There is, however, no information on many key elements, such as the types of annual crop, how the carbon stocks in the living biomass pool in annual crops were derived, or the data and methodology used in the estimation of the carbon stock changes in the soil carbon pools. The ERT recognizes the improvement in the reporting for this category compared with the 2012 inventory submission; however, it recommends that Turkey include further detail on the data and methodologies used in its NIR, such as on the types of annual crop, the basis for the value of the carbon stocks in living biomass applied for annual crops, and the carbon stocks, EFs and AD used for mineral and organic soils in order to improve the transparency of its reporting.

84. Turkey used the gain–loss method to estimate and report the carbon stock changes in the living biomass pool in cropland remaining cropland, assuming a rate of biomass gain for perennial crops of 2.1 Mg C/ha. However, the NIR does not specify the causes of the biomass losses in perennial cropland, other than the assumption that one-third of the biomass stocks is removed by pruning every year. The ERT notes that in perennial cropland, in addition to pruning, a portion of the area under mature crops is removed or harvested and replanted entirely every year without land-use conversion, which will result in additional biomass losses that need to be accounted for. In response to a question raised by the ERT during the review, Turkey explained that, according to the CORINE maps, the removal of perennial cropland can be detected as a conversion to another land use (i.e. grassland, annual crops, etc.). However, if the conversion does not involve the removal of the whole area (i.e. such as selective cutting), it has not been taken into account as it is not a common practice for orchards. The ERT recommends that Turkey include the losses in the living biomass pool due to harvesting and replanting of perennial crops in the estimation methodology, provide transparent information on all losses in the living biomass pool in perennial crops and, more specifically, include information on how the above-mentioned issue has been addressed in the estimation methodology in the NIR of the next inventory submission.

Land converted to cropland – CO_2

85. Turkey has reported in CRF table 5.B the areas of organic soils in grassland converted to cropland as "NE". However, in the NIR, the Party explained that: "In case of emissions from organic soils we assumed that all grasslands are managed (conservative approach)." However, it is not clear why the emissions from organic soils in grassland converted to cropland have not been estimated if all grassland is assumed to be managed. In response to a question raised by the ERT during the review, Turkey explained that, at present, it has estimated and reported the carbon stock changes in organic soils for land remaining in a land-use category only, and not for the land conversion categories. The Party further explained that the methodology for estimating and reporting the carbon stock changes in organic soils in the land conversion categories should be developed and that the issue will be considered for the next inventory submission. The ERT recommends that Turkey develop a methodology and report the carbon stock changes in organic soils in land

converted to cropland, and provide transparent information on this issue in its next inventory submission.

Land converted to grassland – CO_2

86. Turkey reported the changes in the carbon stocks for cropland converted to grassland only and reported the carbon stock changes for all other conversions to grassland as either "NA" or "NE". However, the NIR does not provide any explanation for the use of the notation keys "NA" and "NE" for the reporting for this category. In response to a question raised by the ERT during the review, Turkey explained that this was due to the lack of relevant data to estimate the carbon stocks, although area data are available. The Party also explained that although several projects to improve the information provided in the inventory on these land-use categories are ongoing, their results would not be available before two years. The ERT notes that the appropriate notation key in such cases should be "NE" and not "NA". The ERT recommends that Turkey estimate and report the carbon stock changes in land converted to grassland as soon as the data on carbon stocks become available. The ERT further recommends that, in the cases where it is unable to do so, the Party use the appropriate notation keys, and provide transparent information on the choice of the notation keys, in order to improve the transparency of its reporting.

87. In the NIR, no information has been provided on the data and methods used for estimating the carbon stock changes in cropland converted to grassland, other than the statement that the same carbon stocks determined for perennial crops (country-specific) and annual crops (default value) were used. In response to a request made by the ERT to provide information on the estimation methods used, including the equations and EFs used for grassland, Turkey explained that the carbon stock changes in grassland are assumed to be zero (default approach) due to the absence of spatial information on the condition of grassland (e.g. good, degraded, etc.). However, the Party has estimated the emissions from organic soils for grassland based on the organic soil map by multiplying the AD (area) by the default EFs for grassland (2.5 Mg C/ha for warm climates, 0.5 Mg C/ha for cold climates). The ERT recommends that Turkey increase the transparency of the inventory by including transparent information on the areas, methods, factors and parameters used for the emission and removal estimates related to land converted to grassland in the next inventory submission.

3. Non-key categories

Grassland remaining grassland – CO_2

88. Turkey reported only the carbon stock changes in organic soils in grassland remaining grassland. The carbon stock changes in all other pools were reported as either "NA" or "NE". In the NIR, Turkey explained that the carbon stock changes in grassland are assumed not to change if the management does not change. The Party also explained in the NIR that while grassland rehabilitation projects have been implemented in the country, no change in biomass was assumed, using a conservative approach. In the NIR, Turkey also provided information on its plans to report these emissions when the grassland monitoring system becomes available. Since this issue was identified in the previous review report, the ERT reiterates the recommendation made in the previous review report that Turkey increase the transparency of the information on the areas, methods, factors and parameters used for the emission and removal estimates related to grassland. The ERT also recommends that the Party make efforts to estimate and report the carbon stock changes in all carbon pools for the category grassland remaining grassland.

Forest land converted to other land-use categories – CO_2

89. For forest land converted to other land-use categories, Turkey has not reported any conversions based on ENVANIS. The notation key "NA" was used to report the land-use categories under forest land converted to cropland, forest land converted to grassland and forest land converted to other land, and the notation key "NE" was used to report forest land converted to wetlands and forest land converted to settlements. In response to questions raised by the ERT during the review, Turkey explained that the notation key for the land-use changes from forest land to other land-use categories should be "NO". The same issue was raised in the previous review report, and the ERT reiterates the recommendation made in the previous review report that Turkey ensure the correct use of the notation keys.

F. Waste

1. Sector overview

90. In 2011, emissions from the waste sector amounted to 36,126.64 Gg CO_2 eq, or 8.6 per cent of total GHG emissions. Since 1990, emissions have increased by 271.6 per cent. The key driver for the rise in emissions is the increase in generated and disposed solid waste, resulting in higher CH_4 emissions from solid waste disposal on land (an increase of 403.8 per cent for 2011 (32,173.45 Gg CO_2 eq) compared with 1990 (6,386.46 Gg CO_2 eq)). Within the sector, 89.1 per cent of the emissions were from solid waste disposal on land, followed by 10.8 per cent from wastewater handling and 0.2 per cent from waste incineration. Other (waste) was reported as "NA".

91. Turkey has used a tier 1 method provided in the Revised 1996 IPCC Guidelines to estimate CH_4 emissions from managed and unmanaged solid waste disposal, as well as both CH_4 and N_2O emissions from domestic and commercial wastewater handling, although both categories have been identified as key. Further, the information provided in the NIR on the EFs, AD and relevant parameters used, as well as on the justification for the choice of methodologies used, is not sufficiently detailed. The ERT reiterates the recommendation made in the previous review report that Turkey develop country-specific EFs and use higher-tier methods for the emission estimates for those key categories. The ERT also reiterates the recommendation made in the previous review report that Turkey provide detailed methodological information and an explanation of the trends for those key categories.

92. The results of and procedures related to the uncertainty analysis both for the EFs and the AD for the categories under the waste sector were provided by TurkStat. Turkey has used the methodology provided in the IPCC good practice guidance to produce quantitative uncertainty estimates calculated in CO_2 eq for all CH_4 and N_2O emissions. This is the first time that the Party has reported an uncertainty analysis for N_2O emissions and, therefore, the ERT commends Turkey for its efforts to improve the quality of its reporting. Data on the combined uncertainty for the EFs and AD have been provided as an annex to the NIR.

93. Based on the adopted procedures, Turkey explained in the NIR that when high fluctuations are detected in the emission trends, the AD and emission estimates are re-examined. The ERT commends Turkey for its efforts to improve the quality of the data reported; however, it is not clear in the NIR whether or not the Party has implemented such QA/QC procedures for each category level. The ERT recommends that Turkey provide more detailed information on its QA/QC plan, including whether or not QA/QC procedures are implemented for each category, and if they have not yet been implemented, provide information on the timescale for their implementation for the key categories.

2. Key categories

Solid waste disposal on land – CH_4

94. The CH_4 emissions from solid waste disposal on land have been calculated using the tier 1 method and default values from the Revised 1996 IPCC Guidelines. Municipal waste disposal data were provided by TurkStat (environment statistics). Turkey's waste composition data are also based on the values provided in the Revised 1996 IPCC Guidelines. Although the Party provided emission estimates using the first-order decay (FOD) method from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) in order to compare the emission estimates calculated using the tier 1 method, Turkey explained that the use of the FOD method is not considered to be appropriate due to the lack of waste composition data. For this reason, the Party reported the emission estimates using the tier 1 method. However, despite the recommendation made in the previous review report, detailed information on the calculations and parameters used for the estimates using the FOD method has not been provided in the NIR. Therefore, it is not possible for the ERT to consider whether the tier 1 method is more appropriate than the FOD method. The ERT reiterates the recommendation made in previous review reports that Turkey collect the necessary historical AD, including the waste composition data, if possible, in order to report the emissions using the FOD method rather than the tier 1 method, given that solid waste disposal on land is a key category.

95. Turkey has used a degradable organic carbon (DOC) value of 0.15 for the entire time series, which is the lowest value within the range suggested by the Revised 1996 IPCC Guidelines (0.15–0.40). However, no explanation to justify the use of this value was provided in the NIR. The ERT reiterates the recommendation made in the previous review report that Turkey provide a justification for the use of 0.15 as the DOC value in its NIR.

96. In response to a recommendation made in the previous review report, Turkey has reported in its 2013 inventory submission CH_4 recovery since 2002 when this activity started to be implemented in the country for the first time. CH_4 recovery has been calculated and reported consistently with the IPCC good practice guidance using monitored data. The ERT commends the Party for its efforts to improve the completeness of its reporting.

Wastewater handling – CH_4 and N_2O

97. Turkey calculated CH_4 emissions from domestic wastewater handling using the tier 1 method and default values from the 2006 IPCC Guidelines due to a lack of country-specific data. CH_4 and N_2O emissions from sludge under this category have been reported as "NA", while the AD (total organic product (Gg/degradable organic component/year)) have been reported as "NE". Further, there is no information on the reason why the notation key "NA" has been reported for those emissions from this subcategory. The ERT recommends that Turkey include an explanation to justify the use of the notation key "NA" in its NIR in order to improve the transparency of its reporting, or correct the use of the notation keys. If the use of the notation key "NE" to report the AD is correct, the ERT recommends that the Party correct the AD and estimate the emissions from sludge under this category.

98. The ERT noted that Turkey continues to report CH_4 and N_2O emissions from industrial wastewater and sludge as "NE" due to a lack of data. In response to questions raised by the ERT during the review, Turkey explained that the AD for the years 1994–1997, 2000, 2004, 2008 and 2010 are available and collected via the "Manufacturing Industry Establishments Water, Wastewater and Waste Statistics Survey" undertaken by TurkStat. The Party also informed the ERT that this survey covers all relevant industries

and will be performed biennially, and the missing data will be estimated. The ERT reiterates the recommendation made in previous review reports that Turkey report emissions from this category, making use of the obtained data.

99. The N_2O emissions from human sewage have been calculated using the basic approach from the IPCC good practice guidance, which is based on population statistics and data on protein intake per capita. However, in CRF table 6.B, Turkey has reported the AD (the population) for N_2O emissions from human sewage as "NA". The ERT reiterates the recommendation made in the previous review report that Turkey correct the information in CRF table 6.B and report the population.

3. Non-key categories

Waste incineration – CO_2, CH_4 and N_2O

100. The ERT noted that Turkey reported for the first time in its 2013 inventory submission the CO_2, CH_4 and N_2O emissions from waste incineration for the period 1995–2011 using the tier 1 methodology from the 2006 IPCC Guidelines. The AD for clinical waste for 1995 onwards and the AD for industrial and hazardous waste for 1999 onwards have been used for the estimates. In 2011, CO_2 emissions from this category were estimated as 54.42 Gg CO_2 eq, CH_4 emissions as 4.87 Gg CO_2 eq, and N_2O emissions as 1.02 Gg CO_2 eq, which amounted to 0.2 per cent of total sectoral emissions. Those emissions were reported as "NA" in previous inventory submissions. The ERT commends Turkey for improving the completeness of its inventory. However, the Party has not reported the CO_2, CH_4 and N_2O emissions from this category for the period 1990–1994 and reported as "NA" for those years. In the NIR, the Party explains that the AD is available for clinical waste after 1995 and for industrial and hazardous waste after 1999. The ERT recommends that Turkey continue its efforts to collect AD on waste incineration for the entire time series, or justify its "NA" reporting for the years 1990–1994 in the NIR.

III. Conclusions and recommendations

A. Conclusions

101. Table 6 summarizes the ERT's conclusions on the 2013 inventory submission of Turkey, in accordance with the UNFCCC review guidelines.

Table 6
Expert review team's conclusions on the 2013 inventory submission of Turkey

		Paragraph cross-references
The ERT concludes that the inventory submission of Turkey is complete (categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2011)		
Non-land use, land-use change and forestry[a]	Not complete	
Land use, land-use change and forestry[a]	Not complete	
The ERT concludes that the inventory submission of Turkey has been prepared and reported in accordance with the UNFCCC reporting guidelines	No	Table 4, 26, 27, 35, 47, 49, 63, 91, 94

		Paragraph cross-references
The Party's inventory is in accordance with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*	No	20, 27
The institutional arrangements continue to perform their required functions	Yes	

Abbreviations: CRF = common reporting format, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

B. Recommendations

102. The ERT identified the issues for improvement listed in table 7 below. All recommendations are for the next inventory submission, unless otherwise specified.

Table 7
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
Cross-cutting	Completeness	Include emissions from the categories currently reported using the notation keys "C" and "NE"	Table 3
	General	Make concerted efforts to address the recommendations made in previous review reports, and provide information on the progress made, including the planned improvement measures	14, 15, 20
Energy	Sector overview	Provide a clear explanation in a separate section at the subcategory level for the recalculations in the NIR	18
		Improve the documentation on the inventory for the energy sector	19
	Comparison of the reference approach with the sectoral approach and international statistics	Conduct additional analysis to understand the reasons for the differences between the fuel consumption data reported to the IEA and to the secretariat	23
	International bunker fuels	Determine a data source to obtain	24

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
		accurate fuel consumption data, ensure time-series consistency and estimate and report the emissions for all years ensuring time-series consistency	
		Ensure the consistency of the information reported in CRF table 1.A(b) for CO_2 emissions from fuel combustion activities – reference approach, and CRF table 1.C for international bunkers	25
	Feedstocks and non-energy use of fuels	Collect more disaggregated data on the amount of feedstocks and non-energy use of fuels, or revise the notation keys, as appropriate, and provide the relevant information in the additional information boxes in CRF table 1.A(d)	26
		Explain in the NIR the allocation of fuels used as feedstock and for non-energy purposes between the energy and the industrial processes sectors	26
	Stationary combustion: solid, liquid and gaseous fuels – CO_2	Collect the necessary data and apply a tier 2 method for all key categories	27
		Ensure consistency between the information provided in the CRF tables and in the NIR	27
		When country-specific EFs and parameters are used, include information on the data sources and methodologies used for calculating the EFs at the plant level, and compare those with the default EFs	28
		Provide information on where the emissions from the incineration of waste fuels in cement kilns are reported	29
	Road transportation: liquid fuels – CO_2, N_2O and CH_4	Improve the documentation on the methods applied and provide information on all EFs, assumptions and AD used in developing the country-specific model	30
	Oil and natural gas – CO_2, CH_4 and N_2O	Collect the necessary AD, and estimate and report the emissions from the subcategories currently reported as "NE" using the default EFs provided in	31

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
		the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*	
		Estimate and report CH_4 emissions from natural gas distribution	32
		Explain the expert judgement used for the uncertainties for the EFs and AD	33
Industrial processes and solvent and other product use	Sector overview	Report emissions from the categories with confidential data	35
		Improve documentation on the methods, EFs and AD applied for all categories, especially for the key categories, and on sector-specific QA/QC activities	36
	Cement production – CO_2	Develop a country-specific EF by using plant-specific data	37
		Improve the documentation on the emissions, EFs and clinker (AD) for the entire time series using a tabular format	38
	Lime production – CO_2	Provide information on the EFs used, including the respective types of lime produced to improve transparency	39
		Correct the error in the units used for the EF in the NIR	39
		Provide the reason for the fluctuation in the IEFs including the uses of limestone and dolomite, such as glass production	40
		Include an explanation of how time-series consistency is ensured	40
	Iron and steel production – CO_2	Recalculate the emissions from iron and steel production for the entire time series and provide an analysis of the emissions trend	41
		Reallocate CO_2 emissions from coke consumption to iron production	42
	Consumption of halocarbons and SF_6 – HFCs	Use a higher-tier method, using data on the annual sales of HFC-134a, or by collecting equipment data to apply specific EFs representing each equipment type	43

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
		Include more detailed information on the AD and method used	44
	Soda ash production and use – CO_2	Estimate the emissions from the categories that are subject to confidentiality restrictions and report them at an aggregated level	45
		Provide the CO_2 EF for soda ash production and ensure the consistency of the reporting within the NIR and between the NIR and the CRF tables	46
	Ammonia production – CO_2	Report the emissions at an aggregated level, in cases where the production data are confidential	47
	Nitric acid production – N_2O	Report the emissions at an aggregated level, in cases where the production data are confidential	48
		Provide an explanation for the choice of EF used to estimate N_2O emissions from nitric acid production and provide a description of the number of plants that have NSCR technology	48
	Calcium carbide production – CO_2	Report the emissions at an aggregated level, in cases where the production data are confidential, and provide descriptions of the methods and data used in the NIR	49
	Other (chemical industry) – CH_4	Report the emissions separately under each subcategory and describe the EFs and AD used in the calculations and correct notation key from NA to IE	50
	Ferroalloys production – CO_2	Describe where combustion and process-related emissions are reported, and the method, EFs and AD used	51
	Aluminium production – CO_2 and PFCs	Estimate and reallocate the PFC emissions from consumption of halocarbons and SF_6 to aluminium production for the entire time series, and report both PFC and CO_2 emissions from aluminium production under this category	52
		Describe the methods, EFs and AD used both for CO_2 and PFC emissions	52

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
	SF_6 used in aluminium and magnesium foundries – SF_6	Estimate and report the emissions from SF_6 used in aluminium and magnesium foundries separately, or at an aggregated level	54
Agriculture	Sector overview	Elaborate on the contribution of gases and subcategories within the agriculture sector to total sectoral emissions	56
		Improve the information on the AD providers and provide information on the data sources for the agricultural statistics by source category	57
		Explain the reasons for the differences between the AD used for the GHG inventory and the FAO data	58
		Update the AD and recalculate the emissions in the relevant categories	59
		Improve the transparency of the reporting, and provide tables showing the time series for the EFs, AD and emissions by source category, as well as detailed documentation supporting the choice of EFs	61
		Provide information on category-specific planned improvements	62
	Enteric fermentation – CH_4	Provide information on the inter-annual fluctuations in the animal population	63
		Provide documentation that supports the expert judgement used	64
		Use a tier 2 method for the emissions from significant livestock categories	64
		Provide national data on the milk productivity of dairy cattle from an official source	65
		Provide disaggregated time-series data for sheep (domestic, merinos), and relevant documentation supporting the choice of EFs	66
	Manure management – CH_4 and N_2O	Include background information on the AD to explain the fluctuations in the CH_4 IEF	67
		Estimate the CH_4 emissions using a tier	67

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
		2 method with country-specific EFs for the animal species/categories	
		Compile CRF table 4.B(b) and CRF table 4.B(a) using appropriate information on animal waste management system data and IEFs	68
	Direct soil emissions – N_2O	Complete the evaluation of the accuracy of the N_2O emission estimates and recalculate the N_2O emissions, if appropriate	69
		Estimate the N_2O emissions using a tier 2 method	69
	Rice cultivation – CH_4	Provide documentation on the information/assumption used to determine the harvested area data	70
LULUCF	Sector overview	Estimate the carbon stock changes in all mandatory land-use categories, and provide further information, including on the estimation methods, AD and assumptions used, if any, in the NIR	72
		Ensure the appropriate use of the notation keys in the CRF tables, and provide justification for the notation keys used in a consistent manner in the NIR	72
		Re-examine the land-use data source, and explore the possibility of obtaining a more consistent time series of land-use and land-use change data	73
		Improve the transparency of the documentation on the estimation methodologies used for the different land-use categories by including transparent information on the AD, EFs, other parameters and underlying assumptions used in the inventory methodologies	74
		Provide a complete set of annual land-use change matrices for the period 1990–2012	75
		Include detailed information on the sector-specific QA/QC activities for the LULUCF sector	75

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
	Forest land remaining forest land – CO_2	Consistently use the same subcategories in both the NIR and the CRF tables and explain the methods and factors used for the estimation of the carbon stock changes in degraded forests	77
		Provide clear and transparent documentation on the estimation of the carbon stock changes in living biomass	78
		Provide complete and transparent documentation on how the carbon stock changes in the dead organic matter pool are calculated by presenting the equations, parameters and other data used in the calculation	79
		Estimate the carbon stock changes in soils	81
	Land converted to forest land – CO_2	Estimate the carbon stock changes in soils	82
	Cropland remaining cropland – CO_2	Include further detail on the data and methodologies used in the NIR, such as on the types of annual crop, the basis for the value of the carbon stocks in living biomass applied for annual crops, and the carbon stocks, EFs and AD used for mineral and organic soils	83
		Include transparent information on the losses in the living biomass pool due to harvesting and replanting of perennial crops in the estimation methodology, and on all losses in the living biomass pool in perennial crops, and explain how the issue on the losses in the living biomass pool due to harvesting and replanting of perennial crops has been addressed in the estimation methodology	84
	Land converted to cropland – CO_2	Develop a methodology and report the carbon stock changes in organic soils	85
	Land converted to grassland – CO_2	Estimate and report the carbon stock changes in land converted to grassland	86
		Use the appropriate notation keys and provide transparent information on the choice of the notation keys	86

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
		Increase the transparency of the inventory by including information on the areas, methods, factors and parameters used for the emission and removal estimates	87
	Grassland remaining grassland – CO_2	Increase the transparency of the information on the areas, methods, factors and parameters used for the emission and removal estimates	88
		Estimate and report the carbon stock changes in all carbon pools	88
	Forest land converted to other land-use categories – CO_2	Ensure the correct use of the notation keys	89
Waste	Sector overview	Develop country-specific EFs and use a higher-tier methods for the emission estimates for the key categories	91
		Provide more detailed information on the QA/QC plan	93
	Solid waste disposal on land – CH_4	Use the FOD method to estimate emissions	94
		Provide a justification for the use of the DOC value of 0.15	95
	Wastewater handling – CH_4 and N_2O	Provide a justification for the use of the notation key "NA" to report emissions	97
		Correct the AD and estimate the emissions from sludge	97
		Estimate and report the CH_4 and N_2O emissions from industrial wastewater and sludge	98
		Correct the error in CRF table 6.B	99
	Waste incineration – CO_2, CH_4 and N_2O	Collect AD on waste incineration for the entire time series, or justify its "NA" reporting for the years 1990–1994	100

Abbreviations: AD = activity data, C = confidential, CRF = common reporting format, DOC = degradable organic carbon, EF = emission factor, ERT = expert review team, FAO = Food and Agriculture Organization of the United Nations, FOD = first order decay, GHG = greenhouse gas, IEA = International Energy Agency, IEF = implied emission factor, IPCC = Intergovernmental Panel on Climate Change, LULUCF = land use, land-use change and forestry, NA = not applicable, NE = not estimated, NIR = national inventory report, NSCR = non-selective catalytic reduction, QA/QC = quality assurance/quality control.

Annex I

Background data on recalculations

Table 8
Recalculations in the 2013 inventory submission for the base year and the most recent year

Greenhouse gas source and sink categories	*1990*	*2010*	*1990*	*2010*	*Reason for the recalculation*
	Value of recalculation (Gg CO_2 eq)		*Per cent change*		
1. Energy	754.25	0.01	0.6	0.0	Not provided in CRF table 8(b)
A. Fuel combustion (sectoral approach)		0.01		0.0	
1. Energy industries					
2. Manufacturing industries and construction					
3. Transport					
4. Other sectors					
5. Other		0.01		111.9	
B. Fugitive emissions from fuels	754.25		52.7		
1. Solid fuels	159.42		11.1		
2. Oil and natural gas					
2. Industrial processes		39.31		0.1	AD
A. Mineral products					
B. Chemical industry					
C. Metal production		39.31		0.2	
D. Other production					
E. Production of halocarbons and SF_6					
F. Consumption of halocarbons and SF_6					
G. Other					
3. Solvent and other product use					
4. Agriculture	610.93		2.1		Improved method
A. Enteric fermentation					
B. Manure management					
C. Rice cultivation					
D. Agricultural soils	610.93		9.3		
E. Prescribed burning of savannas					
F. Field burning of agricultural residues					
G. Other					

Greenhouse gas source and sink categories	*1990*	*2010*	*1990*	*2010*	*Reason for the recalculation*
	Value of recalculation (Gg CO_2 eq)		*Per cent change*		
5. Land use, land-use change and forestry	41 072.62	38 120.62	–72.8	–48.4	AD
A. Forest land					
B. Cropland	35 328.45	34 509.45	–305.0	–174.7	
C. Grassland		3 520.33		–2 474.7	
D. Wetlands					
E. Settlements					
F. Other land					
G. Other					
6. Waste	39.79	138.54	0.4	0.4	AD
A. Solid waste disposal on land		41.50		0.1	
B. Wastewater handling	39.79	52.70	1.2	1.4	
C. Waste incineration					
D. Other					
7. Other					
Total CO_2 equivalent without LULUCF	**1 404.97**	**177.86**	**0.8**	**0.0**	
Total CO_2 equivalent with LULUCF	**42 477.58**	**38 298.49**	**32.5**	**11.8**	

Abbreviations: AD = change in activity data, LULUCF = land use, land-use change and forestry.

Annex II

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

"Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention". FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

Status report for Turkey 2013. Available at <http://unfccc.int/resource/docs/2013/asr/tur.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2013. Available at <http://unfccc.int/resource/webdocs/sai/2013.pdf>.

FCCC/ARR/2012/TUR. Report of the individual review of the inventory submission of Turkey submitted in 2012. Available at <http://unfccc.int/resource/docs/2013/arr/tur.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Betül Baygüven (Turkish Statistical Institute), including additional information on the methodologies and assumptions used.

Annex III

Acronyms and abbreviations

AD	activity data
C	confidential
CaO	calcium oxide
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
FAO	Food and Agriculture Organization of the United Nations
FOD	first order decay
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
ha	hectare
HFCs	hydrofluorocarbons
HNO_3	nitric acid
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram (1 kg = 1,000 grams)
kha	kilohectare
LULUCF	land use, land-use change and forestry
Mg	megagram (1 Mg = 1 tonne)
N	nitrogen
NA	not applicable
NCV	net calorific value
NE	not estimated
N_2O	nitrous oxide
NIR	national inventory report
NO	not occurring
NSCR	non-selective catalytic reduction
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
SF_6	sulphur hexafluoride
t	tonne
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change